WALCHAND COLLEGE OF ENGINEERING, SANGLI

(Government-Aided Autonomous Institute)

Department of Electronics Engineering

Final Year B. Tech. Project Synopsis

Self-reliant solar irrigation system

Submitted By Group-7

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1. Introduction

Agriculture is the practice of cultivating plants and livestock. It played a crucial role on the rise of human civilization. History of agriculture began thousands of years ago. Back then agriculture was done in a primitive manner. With improved technology and knowledge of agro-science, agriculture has seen an exponential growth in terms of quality and production. In developed economies, these tech advancements are very significantly utilised but developing countries like India still lag. Dependence on natural forces like rain, pests, etc. for all aspects of farming is really concerning. Cultivators in this scenario look quite helpless. One such aspect is scarcity of water or drought. To counter this, we have developed a mechanism which will supply water to the crops whenever required automatically. The same mechanism can also be used in gardens at home to water the plants as per our convenience and plant requirements.

2. Literature Survey

Agriculture being the heart of the economy, the production in the agricultural sector is a very significant contributor to India's GDP and recession in agricultural production will constrain economic development. Irrigation being the spine of agricultural cultivation, traditional irrigation methodologies do not fulfill the need of today's supply-demand chain.

According to the paper "Small farmers in India: Challenges and opportunities", farmers today face globalization challenges, role of climate change, water problems and irrelevant labour cost as efficiency of manual labour is less and can reduce even further in unfavourable climate.

"Future directions for Indian irrigation" in its "critical issues faced by Indian farmers" mentions Total irrigated area reportedly rose from 22.6 million hectares (17 percent of crop area) in 1950-51 to 54.1 million hectares (31 percent of crop area) in 1984/85.

In the paper "Microcontroller based Controlled Irrigation System for Plantation", older generation with lesser memory microcontroller is used to control the system but the proposed system made use of Node MCU which is easily programmable.

By referring to all the above papers it was concluded that to have effective crop production taking efficiency, net profit and reduced dependence on human labour, implementing IoT in irrigation will help farmers a lot, especially poor indian farmers. For

that we are using a low cost IoT platform. The proposed system includes features such as displaying temperature, humidity and soil moisture values and also automatic switching on and off of the motor by considering soil moisture values. Besides this, the proposed system also has given users the facility to manually operate the system.

In 1881, Charles Fritts created the first commercial solar panel after which there was no turning back, these solar panels were developed by the years in a more and more efficient manner. Energy demands in the recent years have been recorded to be growing at an exponential rate by the commercial and as well as domestic markets. Solar energy is the most abundant and easy to harness resource through Solar panels.

Marie France Leroux et al designed and developed the automated irrigation system with the feedback system to resolve the complexity and stability issues. The design has consumed less power and shows the reducing consumption of water.

3. Proposed Work

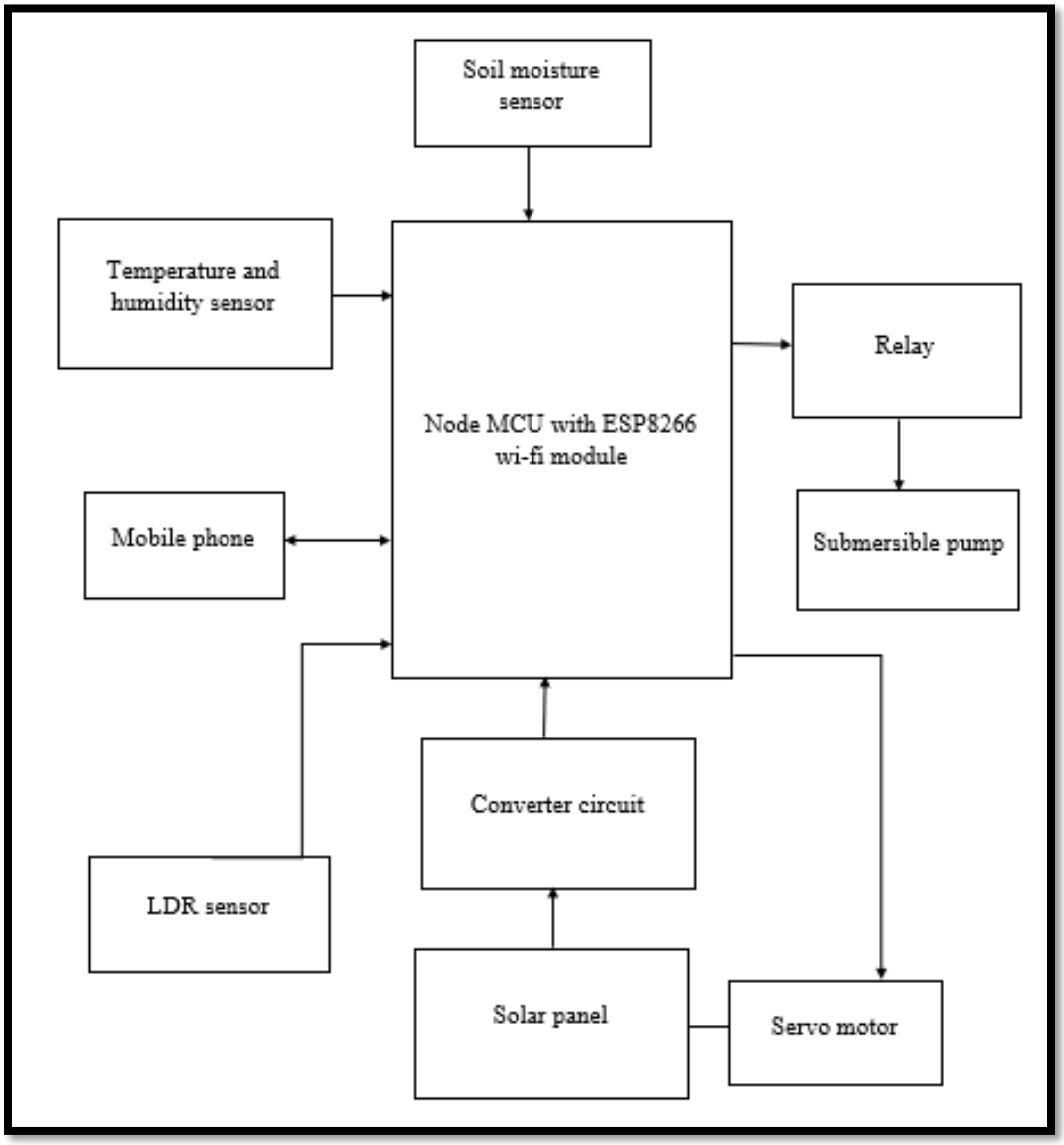
This project proposes the idea of using IoT microcontroller platform to aid supplying water to the crop, whenever the need to irrigate arises. This will happen by evaluating soil moisture levels. Humidity and temperature will also be needed to monitor the crop condition, giving cultivators a basic idea of the conditions even if he/she isn't nearby the farm. For that purpose, we will also develop a mobile app that notifies soil moisture levels, temperature, and humidity. This system will be operated automatically most of the time but to give some authority to the cultivator, we will give manual control as well. And energy for this project will be supplied by solar tracker, which will rotate in the direction of sun. Hence, we get maximum solar output.

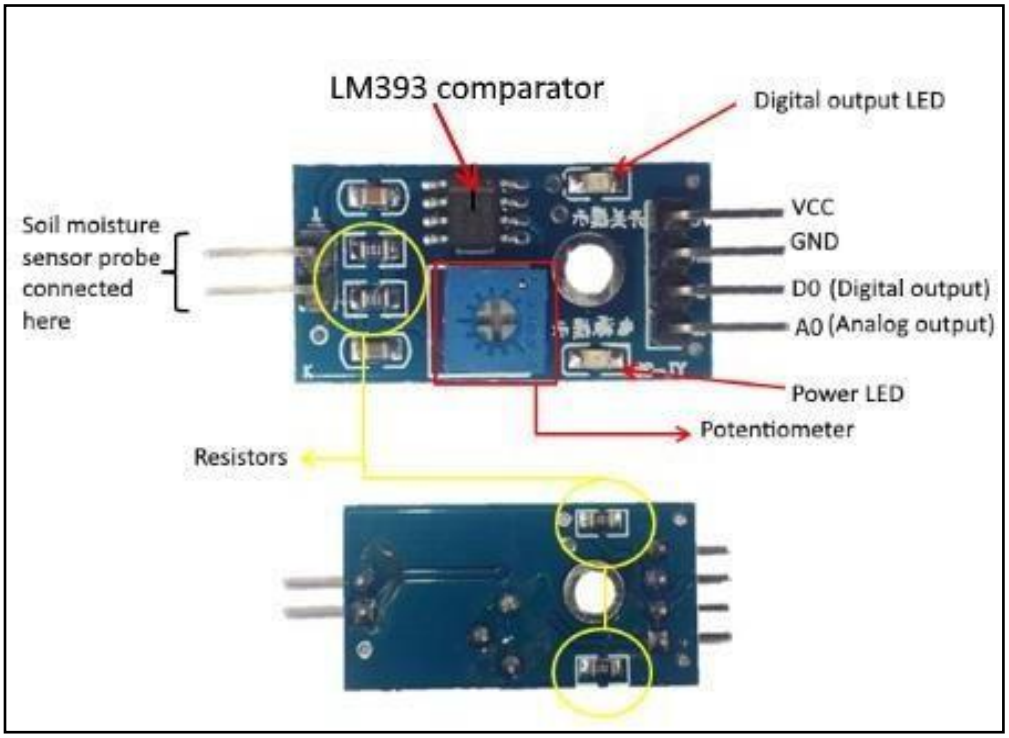
4. Objectives

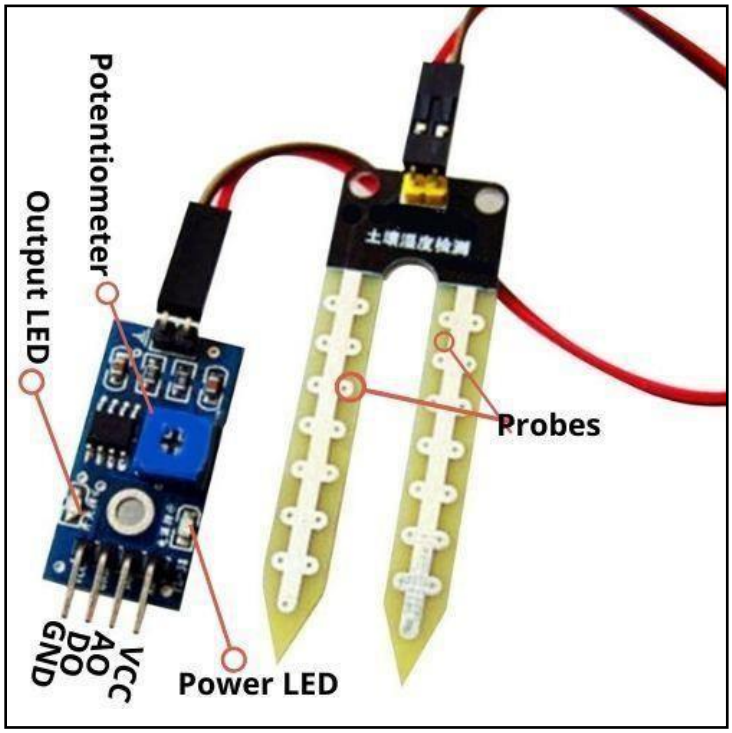
- To reduce the dependence on rain for irrigation by monitoring the soil moisture content.
- Using renewable source of energy, in this project solar energy, to power the smart irrigation project.
- Making crop conditions virtually accessible from any part of the world by designing a mobile app and hosting data on the web.

5. Methodology

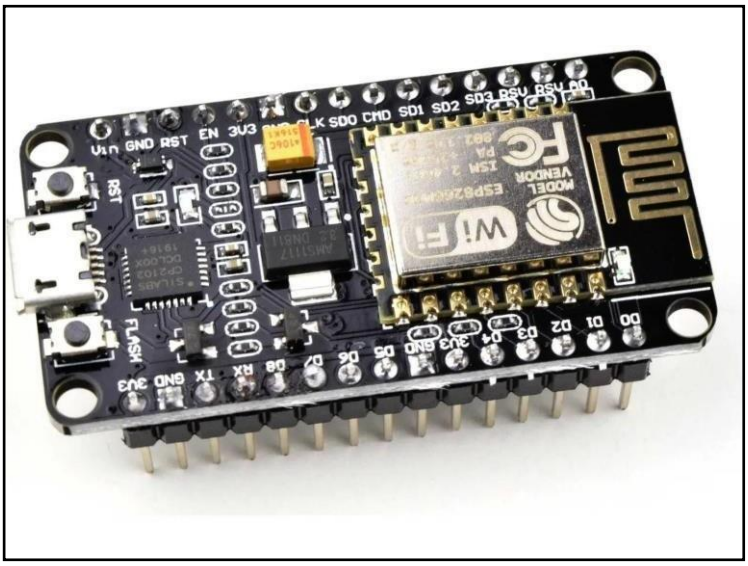
A flowchart for our proposed project is illustrated below:



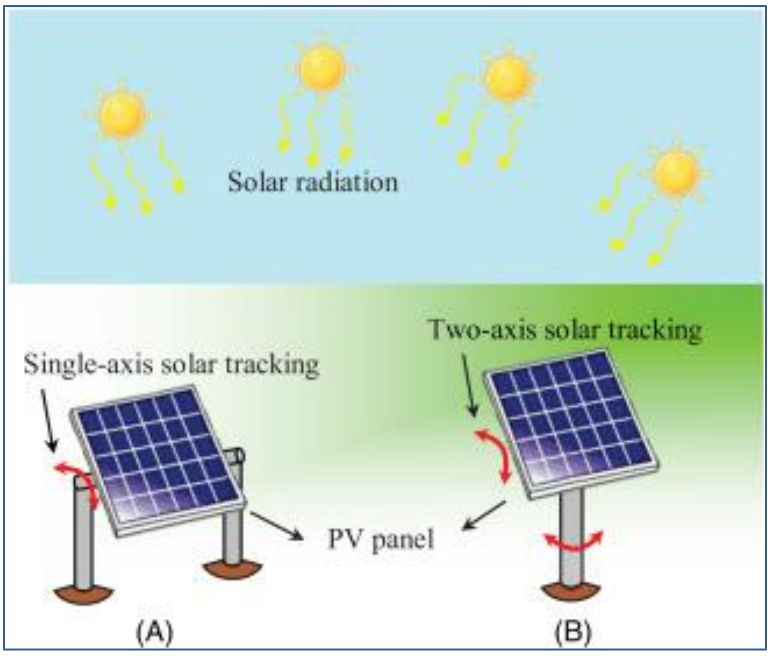




soil moisture sensor module



Node MCU with ESP8266 wifi



Solar Tracker System

6. Expected Outcome

This smart irrigation system has 2 modes, one is manual and the other is the self-mode

- In manual mode we can monitor the real-time status of the environment of our garden like temperature, humidity, soil moisture, etc. In this mode, we can control the appliance on our choices or depending upon the current situations.
- In a self-mode the system will become independent from its owner's operation, it can perform its work on its own, simply it will handle itself Smartly based on the current situation.
- For different variety of crop, we can choose as per our requirement from the mobile app itself.
- To maximize the power output, solar tracker will work based on the LDR sensor.

7. References

A) Research papers :

[1] WP-2012-014.pdf (igidr.ac.in) - Small farmers in India:Challenges and opportunities by S. Mahendra Dev.

[2] Future directions for Indian irrigation | IFPRI : International Food Policy Research Institute

[3] Micro-Controller-Based-Automatic-Plant-Irrigation-System.pdf (ijoart.org) - Venkata Naga, Rohit Gunturi, "Micro Controller Based Automatic Plant Irrigation System", International Journal of Advancements in Research & Technology, Volume 2, Issue4, April-2013.

B) Websites:

[1] https://en.wikipedia.org/wiki/NodeMCU

[2] https://en.wikipedia.org/wiki/Soil_moisture_sensor

[3] http://wiki.sunfounder.cc/index.php?title=Humiture_Sensor_Module

[4] https://www.geeetech.com/wiki/index.php/One-Channel_Relay_module

[5] https://www.electronicshub.org/getting-started-with-nodemcu/

[6] Soil Moisture Sensor | How it's Works » ElectroDuino

[7] https://www.sciencedirect.com/topics/engineering/solar-tracking-system

8. List of Components

Sr. No	Name of Component	Quantity
1	Node MCU withinbuilt ESP8266	1
2	DHT 11 temp. & Humidity Sensor	1
3	Soil Moisture Sensor module	3
4	Submersible Pump	1
5	Jumper Wire	30 pair
6	5V Power Supply	1
7	Pipe	1
8	Connecting wires(1mm)	2 meters
9	Solar Panel	1
10	Servo Motor	3
11	LDR	4
12	Electronic components Like resistor, transistor,etc.	----

9. Proposed Work Plan

Sr. No.	Work/ Activity	Month
1.	Choosing the problem statement and segregation into 2 parts	September 2022
2.	Circuit design of PART-1 (IOT Irrigation System)	October 2022
3.	Implementation of PART-1 system	November 2022
4.	Documentation and Demonstration of PART-1	December 2022
5.	Circuit design of PART-2 (Solar Tracker System)	January 2023
6.	Implementation of PART-2	February 2023
7.	Combining PART-1 and PART-2 and Project Testing	March 2023
8.	Documentation, Demonstration and delivering the Final Presentation	April 2023